

Listing of Claims:

1. (Original) An image pickup system for tone converting and outputting a color signal of a primary color or a color signal of a complementary color from an image pickup apparatus, the system comprising:

5 color space converting means for converting the color signal to signals in a color space having three signals including a luminance signal, a hue signal and a chroma signal;

 tone converting means for performing tone conversion on the luminance signal;

10 correction coefficient calculating means for calculating a chroma correction coefficient to be used for performing correction on the chroma signal;

 maximum chroma calculating means for calculating a first maximum chroma value in the color space with respect to the
15 luminance signal from the color space converting means and the hue signal from the color space converting means and a second maximum chroma value in the color space with respect to the luminance signal converted by the tone converting means and the hue signal from the color space converting means; and

20 chroma correcting means for performing correction on the
chroma signal based on the first maximum chroma value, the second
maximum chroma value and the chroma correction coefficient.

2. (Original) An image pickup system for tone converting
and outputting a color signal of a primary color or a color
signal of a complementary color from an image pickup apparatus,
the system comprising:

5 color space converting means for converting the color signal
to signals in a color space having three signals including a
luminance signal, a hue signal and a chroma signal;

tone converting means for performing tone conversion on the
luminance signal;

10 correction coefficient calculating means for calculating a
hue correction coefficient to be used for correcting the hue
signal with respect to the hue signal in a predetermined range
and for calculating a chroma correction coefficient to be used
for correcting the chroma signal with respect to the hue signal
15 in the predetermined range;

maximum chroma calculating means for calculating a first
maximum chroma value in the color space with respect to the

luminance signal from the color space converting means and the
hue signal from the color space converting means and a second
20 maximum chroma value in the color space with respect to the
luminance signal converted by the tone converting means and the
hue signal corrected by using the hue correction coefficient; and
chroma correcting means for performing correction on the
chroma signal based on the first maximum chroma value, the second
25 maximum chroma value and the chroma correction coefficient.

3. (Original) An image pickup system for tone converting
and outputting a color signal of a primary color or a color
signal of a complementary color from an image pickup apparatus,
the system comprising:

5 color space converting means for converting the color signal
to signals in a color space having three signals including a
luminance signal, a hue signal and a chroma signal;

tone converting means for performing tone conversion on the
luminance signal;

10 first correction coefficient calculating means for
calculating a first chroma correction coefficient to be used for
performing correction on the chroma signal;

second correction coefficient calculating means for
calculating a hue correction coefficient to be used for
15 correcting the hue signal with respect to the hue signal in a
predetermined range and for calculating a second chroma
correction coefficient to be used for correcting the chroma
signal with respect to the hue signal in the predetermined range;

maximum chroma calculating means for calculating a first
20 maximum chroma value in the color space with respect to the
luminance signal from the color space converting means and the
hue signal from the color space converting means and a second
maximum chroma value in the color space with respect to the
luminance signal converted by the tone converting means and the
25 hue signal corrected by using the hue correction coefficient; and

chroma correcting means for performing correction on the
chroma signal based on the first maximum chroma value, the second
maximum chroma value, the first chroma correction coefficient and
the second chroma correction coefficient.

4. (Currently Amended) An image pickup system according to
Claim 1, ~~2 or 3~~, wherein the color space converting means uses a
YCbCr color space or a CIE Lab color space as a color space.

5. (Currently Amended) An image pickup system according to Claim 1, wherein the correction coefficient calculating means ~~comprising~~ comprises at least one of:

chroma suppress means for calculating a chroma correction coefficient based on an edge strength value calculated from the luminance signal;

highlight cyan means for calculating a chroma correction coefficient based on the luminance signal; and

chroma emphasis means for calculating a chroma correction coefficient based on the hue signal.

6. (Currently Amended) An image pickup system according to Claim 3,

wherein the first correction coefficient calculating means ~~comprising~~ comprises at least one of:

~~the~~ chroma suppress means for calculating a first chroma correction coefficient based on an edge strength value calculated from the luminance signal;

~~the~~ highlight cyan means for calculating a first chroma correction coefficient based on the luminance signal; and

~~the~~ chroma emphasis means for calculating a first chroma correction coefficient based on the hue signal.

7. (Currently Amended) An image pickup system according to Claim 1 ~~, 2 or 3~~, wherein the maximum chroma calculating means ~~comprising~~ comprises:

recording means for recording a function for associating a
5 luminance signal and a maximum chroma value for multiple predetermined hue planes;

searching means for searching two nearest hue planes adjacent to the hue signal from multiple hue planes recorded in the recording means;

10 retrieving means for retrieving functions relating to the two hue planes searched by the searching means from the recording means;

calculating means for calculating two maximum chroma values based on the two functions retrieved by the retrieving means and
15 the luminance signal;

interpolating means for interpolating and obtaining a maximum chroma value with respect to the hue signal from the two maximum chroma values.

8. (Original) An image pickup system according to Claim 7, wherein the recording means records a high intensity function for associating a luminance signal having a value equal to or higher

than a predetermined intensity value and a maximum chroma value,
5 a low intensity function for associating a luminance signal
having a value equal to or lower than the predetermined intensity
value and the maximum chroma value with respect to each of the
multiple predetermined hue planes, and the predetermined
intensity value.

9. (Original) An image pickup system according to Claim 7,
wherein the recording means records at least one of a primary
function, a polynomial function, a power function and a spline
function as the function.

10. (Original) An image pickup system according to
Claim 7, wherein the recording means includes hue planes of red,
green, blue, cyan, magenta and yellow as the multiple
predetermined hue planes.

11. (Currently Amended) An image pickup system according
to Claim 1, ~~2 or 3,~~ wherein the maximum chroma calculating means
~~comprising:~~ comprises table means for recording a maximum chroma
value in the color space with respect to the luminance signal and
5 the hue signal.

12. (Currently Amended) An image pickup system according to Claim 1 ~~or 2~~, wherein the chroma correcting means ~~comprising~~ comprises:

ratio calculating means for calculating a ratio between the
5 first maximum chroma value and the second maximum chroma value;

multiplying means for multiplying the chroma signal by the ratio and the chroma correction coefficient; and

limiting means for setting a limit such that the chroma signal having been multiplied by the ratio and the chroma
10 correction coefficient by the multiplying means may not deviate from the second maximum chroma value.

13. (Currently Amended) An image pickup system according to Claim 3, wherein the chroma correcting means ~~comprising~~ comprises:

~~the~~ ratio calculating means for calculating a ratio between
5 the first maximum chroma value and the second maximum chroma value;

~~the~~ multiplying means for multiplying the chroma signal by the ratio, the first chroma correction coefficient and the second chroma correction coefficient; and

10 ~~the~~ limiting means for setting a limit such that the chroma
signal having been multiplied by the ratio, the first chroma
correction coefficient and the second chroma correction
coefficient by the multiplying means may not deviate from the
second maximum chroma value.

14. (Currently Amended) An image pickup system according to
Claim 12 ~~or 13~~, wherein the limiting means ~~comprising~~ comprises
replacing means for replacing the chroma signal by the second
maximum chroma value when the chroma signal from the multiplying
5 means deviates from the second maximum chroma value.

15. (Currently Amended) An image pickup system according
to Claim 12 ~~or 13~~, wherein the limiting means ~~comprising~~
comprises nonlinear compressing means for, when the chroma signal
from the multiplying means exceeds a predetermined threshold
5 value lower than the second maximum chroma value, converting the
chroma signal to a value between the second maximum chroma value
and the threshold value.

16. (Currently Amended) An image processing program for
causing a computer to function as:

color space converting means for converting a color signal
of a primary color or a color signal of a complementary color to
5 signals in a color space having three signals including a
luminance signal, a hue signal and a chroma signal;

tone converting means for performing tone conversion on the
luminance signal;

correction coefficient calculating means for calculating a
10 chroma correction coefficient to be used for performing
correction on the chroma signal;

maximum chroma calculating means for calculating a first
maximum chroma value in the color space with respect to the
luminance signal from the color space converting means and the
15 hue signal from the color space converting means and a second
maximum chroma value in the color space with respect to the
luminance signal converted by the tone converting means and the
hue signal from the color space converting means; and

chroma correcting means for performing correction on the
20 chroma signal based on the first maximum chroma value, the second
maximum chroma value and the chroma correction coefficient.

17. (Currently Amended) An image processing program for
causing a computer to function as:

color space converting means for converting a color signal
of a primary color or a color signal of a complementary color to
5 signals in a color space having three signals including a
luminance signal, a hue signal and a chroma signal;

tone converting means for performing tone conversion on the
luminance signal;

correction coefficient calculating means for calculating a
10 hue correction coefficient to be used for correcting the hue
signal with respect to the hue signal in a predetermined range
and for calculating a chroma correction coefficient to be used
for correcting the chroma signal with respect to the hue signal
in the predetermined range;

15 maximum chroma calculating means for calculating a first
maximum chroma value in the color space with respect to the
luminance signal from the color space converting means and the
hue signal from the color space converting means and a second
maximum chroma value in the color space with respect to the
20 luminance signal converted by the tone converting means and the
hue signal corrected by using the hue correction coefficient; and

chroma correcting means for performing correction on the chroma signal based on the first maximum chroma value, the second maximum chroma value and the chroma correction coefficient.

18. (Original) An image processing system for causing a computer to function as:

color space converting means for converting a color signal of a primary color or a color signal of a complementary color to
5 signals in a color space having three signals including a luminance signal, a hue signal and a chroma signal;

tone converting means for performing tone conversion on the luminance signal;

first correction coefficient calculating means for
10 calculating a first chroma correction coefficient to be used for performing correction on the chroma signal;

second correction coefficient calculating means for calculating a hue correction coefficient to be used for correcting the hue signal with respect to the hue signal in a
15 predetermined range and for calculating a second chroma correction coefficient to be used for correcting the chroma signal with respect to the hue signal in the predetermined range;

maximum chroma calculating means for calculating a first maximum chroma value in the color space with respect to the
20 luminance signal from the color space converting means and the hue signal from the color space converting means and a second maximum chroma value in the color space with respect to the luminance signal converted by the tone converting means and the hue signal corrected by using the hue correction coefficient; and
25 chroma correcting means for performing correction on the chroma signal based on the first maximum chroma value, the second maximum chroma value, the first chroma correction coefficient and the second chroma correction coefficient.

19. (New) An image pickup system according to Claim 2, wherein the color space converting means uses a YCbCr color space or a CIE Lab color space as a color space.

20. (New) An image pickup system according to Claim 3, wherein the color space converting means uses a YCbCr color space or a CIE Lab color space as a color space.

21. (New) An image pickup system according to Claim 2, wherein the maximum chroma calculating means comprises:

recording means for recording a function for associating a
luminance signal and a maximum chroma value for multiple
5 predetermined hue planes;

searching means for searching two nearest hue planes
adjacent to the hue signal from multiple hue planes recorded in
the recording means;

retrieving means for retrieving functions relating to the
10 two hue planes searched by the searching means from the recording
means;

calculating means for calculating two maximum chroma values
based on the two functions retrieved by the retrieving means and
the luminance signal;

15 interpolating means for interpolating and obtaining a
maximum chroma value with respect to the hue signal from the two
maximum chroma values.

22. (New) An image pickup system according to Claim 3,
wherein the maximum chroma calculating means comprises:

recording means for recording a function for associating a
luminance signal and a maximum chroma value for multiple
5 predetermined hue planes;

searching means for searching two nearest hue planes adjacent to the hue signal from multiple hue planes recorded in the recording means;

10 retrieving means for retrieving functions relating to the two hue planes searched by the searching means from the recording means;

calculating means for calculating two maximum chroma values based on the two functions retrieved by the retrieving means and the luminance signal;

15 interpolating means for interpolating and obtaining a maximum chroma value with respect to the hue signal from the two maximum chroma values.

23. (New) An image pickup system according to Claim 21, wherein the recording means records a high intensity function for associating a luminance signal having a value equal to or higher than a predetermined intensity value and a maximum chroma value,
5 a low intensity function for associating a luminance signal having a value equal to or lower than the predetermined intensity value and the maximum chroma value with respect to each of the multiple predetermined hue planes, and the predetermined intensity value.

24. (New) An image pickup system according to Claim 22,
wherein the recording means records a high intensity function for
associating a luminance signal having a value equal to or higher
than a predetermined intensity value and a maximum chroma value,
5 a low intensity function for associating a luminance signal
having a value equal to or lower than the predetermined intensity
value and the maximum chroma value with respect to each of the
multiple predetermined hue planes, and the predetermined
intensity value.

25. (New) An image pickup system according to Claim 21,
wherein the recording means records at least one of a primary
function, a polynomial function, a power function and a spline
function as the function.

26. (New) An image pickup system according to Claim 22,
wherein the recording means records at least one of a primary
function, a polynomial function, a power function and a spline
function as the function.

27. (New) An image pickup system according to Claim 21,
wherein the recording means includes hue planes of red, green,

blue, cyan, magenta and yellow as the multiple predetermined hue planes.

28. (New) An image pickup system according to Claim 22, wherein the recording means includes hue planes of red, green, blue, cyan, magenta and yellow as the multiple predetermined hue planes.

29. (New) An image pickup system according to Claim 2, wherein the maximum chroma calculating means comprises table means for recording a maximum chroma value in the color space with respect to the luminance signal and the hue signal.

30. (New) An image pickup system according to Claim 3, wherein the maximum chroma calculating means comprises table means for recording a maximum chroma value in the color space with respect to the luminance signal and the hue signal.

31. (New) An image pickup system according to Claim 2, wherein the chroma correcting means comprises:

ratio calculating means for calculating a ratio between the first maximum chroma value and the second maximum chroma value;

5 multiplying means for multiplying the chroma signal by the
ratio and the chroma correction coefficient; and

limiting means for setting a limit such that the chroma
signal having been multiplied by the ratio and the chroma
correction coefficient by the multiplying means may not deviate
10 from the second maximum chroma value.

32. (New) An image pickup system according to Claim 31,
wherein the limiting means comprises replacing means for
replacing the chroma signal by the second maximum chroma value
when the chroma signal from the multiplying means deviates from
5 the second maximum chroma value.

33. (New) An image pickup system according to Claim 13,
wherein the limiting means comprises replacing means for
replacing the chroma signal by the second maximum chroma value
when the chroma signal from the multiplying means deviates from
the second maximum chroma value.

34. (New) An image pickup system according to Claim 31,
wherein the limiting means comprises nonlinear compressing means
for, when the chroma signal from the multiplying means exceeds a

predetermined threshold value lower than the second maximum
5 chroma value, converting the chroma signal to a value between the
second maximum chroma value and the threshold value.

35. (New) An image pickup system according to Claim 13,
wherein the limiting means comprises nonlinear compressing means
for, when the chroma signal from the multiplying means exceeds a
predetermined threshold value lower than the second maximum
5 chroma value, converting the chroma signal to a value between the
second maximum chroma value and the threshold value.